ABSTRACT OF THE DISCLOSURE

An insulating film comprising: a first barrier layer; a well layer provided; and a second barrier layer is proposed. The first barrier layer consists of a material having a first bandgap and a first relative permittivity. The well layer is provided on the first barrier layer, and consists of a material having a second bandgap smaller than the first bandgap and having a second relative permittivity larger than first relative permittivity. Discrete energy levels are formed in the well layer by a quantum effect. The second barrier layer is provided on the well layer, and consists of a material having a third bandgap larger than the second bandgap and having a third relative permittivity smaller than second relative permittivity. Alternatively, an insulating film comprising: n (n being an integer larger than 2) layers of barrier layer consisting of a material having a bandgap larger than a first bandgap and having a relative permittivity smaller than a first relative permittivity; and (n-1) layers of well layers consisting of a material having a bandgap smaller than the first bandgap and having a relative permittivity larger than the first relative permittivity, discrete energy levels being formed in the well layer by a quantum effect, each of the barrier layers and each of the well layers being stacked by turns, and discrete energy levels being formed in each of the well layers by a quantum effect,

is provided. Alternatively, an insulating film having a lattice mismatch within a range of plus-or-minus 1.5% to the substrate, and further having a high barrier and a large permittivity is provided.